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There are chapters on carriages, coaching, the age of bad roads, the turn-pike system, and scientific road making. The account of bad roads shows vividly that Americans are not quite so far behind the mother country in road improvement, as we are wont to think. The account of scientific road making deals with Telford and Macadam, whose main work was in the early part of the nineteenth century, coincident in time with the first great epoch of road building in the United States.

Interior navigation follows under the topics,—rivers and river transport, river improvement, disadvantages of river navigation, and the canal era. The first of this group of chapters is one of the most interesting in its emphasis on the efficiency of rivers in the early days, in promoting the progress of towns on their banks, when the inter-stream areas were difficult of access. One of the examples noted at some length is the Severn and its branches bordered by many towns and on whose waters in 1756 there were nearly 400 vessels.

About half the volume relates to the history and administration of English roads and here the author is in the field of much of his previous work. From the origin and expansion of railroads he passes to chapters on railroads and the state, rates and charges, the railroads of to-day, and railroads as a national industry. Two chapters are given to yet more modern ways of transport, such as street cars, the motor bus, cycles and electric traction. The "Outlook" discusses among other questions that of aerial transportation. A rather full list of authorities is included in the volume.

A. P. BRIGHAM.

WORLD AND PARTS OF IT

La Grande Boucle. Notes et Croquis de l'Ancien Continent et des Deux Amériques. Par Maurice Rondet-Saint. vi and 314 pp. Map. Plon-Nourrit et Cie, Paris, 1910. 7½ x 5.

The author writes with nervous vigor and photographic effect. Most of his matter is adapted to give the general reader useful, and in the main, correct information about many of the important places he visited on his extended journey. Occasionally, however, he is inaccurate and, at least in our country, he seems unfairly influenced by his prejudices. Most of us are "Yankees" and his comments on the various phases of this particular species of the human race are flippant and funny. It is to be regretted, if true, that any mention of our Far West always suggests to the author "the romances of Fenimore Cooper." This idea introduces his remarks on Seattle-Tacoma, nearly 3,000 miles west of the region where Cooper and many of the Indians he depicted lived out their days.

PHYSICAL GEOGRAPHY

Das Gesetz der Wüstenbildung. Von Johannes Walther. 2. neubearbeitete Auflage. xv and 342 pp. Ills., index. Quelle & Meyer, Leipzig, 1912. Mk. 12. 10 x 7.

The appearance of a splendid new edition of this long since exhausted work by the "desert geologist" Walther, is an event of importance to students of geological science. The delay in issuing the new edition has been due to the author's wish to complete further desert studies with a view to clearing up many subjects concerning which uncertainty existed. As a result we now have an essentially new book comprising twice the number of pages and including three times the number of illustrations. The illustrations are high grade half-tones made from excellent photographs. Remarkable as they are as examples of what good modern book-work may be, they are as a whole even more noteworthy as well selected types in illustration of the characteristic desert processes.

The author's clear and graphic style and his excellence of presentation are here shown at their best. Despite the wealth of observed fact and the introduction of a good many exact figures, the interest never flags, and one

reads under a certain fascination as the desert scenes are one after the other unrolled as upon a huge panorama. If we take account of the psychology of our geological theories, it must be realized that they have almost throughout been modeled from the ever-present scenes of the generally habitable humid countries. It has mattered little that a fifth of the continental surface is desert, a much larger area half-desert, and that with much probability these proportions were even larger in the geological past. In so far as the contrasted geological processes characteristic of arid and humid regions have been appreciated at all, they have thus far influenced but little our conceptions of the great erosional and depositional processes in present or past time. More than any other, Professor Walther has focused attention upon these essential contrasts, and in the face of much opposition is forcing a reluctant recognition of the importance of studying the deserts in order correctly to interpret the past. Such a recognition is necessarily slow, since it involves a making over of fundamental doctrines of the science of geology.

It was a study of the enormously thick deposits of barren conglomerates, sandstones and shales with their included gypsum and salt layers, belonging to the transition from Paleozoic to Mesozoic in Europe, which, a quarter of a century ago, drove Walther into the desert for a possible solution of the puzzle. Later journeys have since been undertaken until now his personal experience of desert conditions includes both borders of the Red Sea, Egypt and the Sudan, and the arid lands of Turkestan and North America. It is by correlation of facts drawn from so many widely separated regions that the general principles underlying desert processes have been skillfully deduced.

The book is divided into 31 sections organized under the four heads: (1), the essential conditions of deserts; (2), desert weathering and transportation; (3), desert deposition; and (4), the earlier deserts. The four types of climate recognized are: nival or snow climate, the humid climate, the arid climate, and the pluvial climate. Each is generally characterized by a special type of precipitation and a characteristic color of soil. Where a nival climate prevails precipitation occurs mainly as snow, and the soil is gray to black according as organic acids have leached out the materials. With humid climate precipitation takes place mainly as rain in summer and as snow in winter, the soils being characteristically rust-brown in color from oxidation and hydration of iron. In a land of arid climate there is little precipitation of any kind and the soils, altered but little chemically, retain their original and varied colors, though the finer wind-borne portions, when carried to the moister zones at the desert margin, become rust-brown. Lastly, the pluvial climate with heavy rain precipitation and high air temperatures is characterized by deep red soils covered by a heavy mat of vegetation.

One of the most striking contrasts between arid and humid regions is brought out in maps of the divides or watersheds. Of humid countries it is true that the divides radiate from the highest point and continue to divide and subdivide until they reach the sea, but nowhere touching or crossing each other. In a region without outflow, on the other hand, they cross and recross to form the network of larger and smaller meshes.

The desert weathering process which in the original edition was described as *insolation*—the rending of rocks when highly heated on the surface under the desert sun and suddenly chilled by a dash of rain—is much more fully treated in the new edition and supported by admirable illustrations. We think it unfortunate that a term already in general use to describe the distribution of the sun's rays over the globe should have been given a new meaning, and we have elsewhere suggested the term *diffusion* as more appropriate.

The general lack of rain, which in humid countries carries the air with it into the soil so as to ventilate and oxidize the soil particles, accounts for the far more varied (original) hues of rock débris within a desert. Chemical decomposition of rocks there involves wholly different reactions from those of humid regions. Proof of this is supplied by the hard rock rinds and altered cores of the loose desert rocks which contrast so strongly with the reversed relationships in those found within humid regions. In addition to the brown protective rock rind generally known as "desert varnish" and

believed to be due to a drawing out of salts from the interior and fusion reactions at the surface of the rock, Walther has distinguished two additional types of coating. These are described as "dust rinds," where fine rock dust carried by a strong wind is driven into all surface cracks and pores; and "cataract rinds," formed beneath the water in stream rapids and composed, as Lucas has shown for those seen at Assuan, mainly of manganese and iron oxides together with lime silica and magnesia.

As in the earlier edition, the pan-like form of deserts is probably somewhat too strongly emphasized. The extended high plateau, or hamada, which American and French savants in particular have made known, has not influenced Walther's general definitions as much as it should have done. Likewise the statements concerning a desert's lack of outflow are somewhat too emphatically made in view of the examples of the Nile and Colorado particularly. To the many striking characteristics of deserts which were brought out in the original edition of the work, is now added that of a surface armor due to the removal by the wind of all materials which readily succumb to weathering processes and become finely divided, thus leaving a layer composed of the various hard and insoluble concretions. Such an armor is naturally best developed upon the high hamadas which are preeminently areas of removal rather than of deposition of débris. Yet of the broadly extended weather pans it is likewise true that the peculiar weathering processes and the lack of the shielding mat of vegetation found in humid regions, makes all rock material which can succumb to the disintegrating agencies the special prey of the winds to be by them carried out of the desert. Walther believes that the great pans themselves have originated by this process, and supports his view by such a wealth of well ordered observations as to be quite convincing.

The book is marred by an extended and ever recurring argument to support the author's view that what has been brought forward as evidence from the deserts of changes of climate may all be explained by local cloudbursts. He would appear to be unaware of the existence of the most important recent literature upon the subject. It is really remarkable that in the list of 157 monographs treating of deserts with which the work is concluded, the names of Raphael Pumpelly and Ellsworth Huntington should nowhere appear. The book throughout takes far too little account of other than German workers. It is none the less a great work and as a general treatise upon the subject of desert geology altogether unique. A very large proportion of the illustrations have been drawn from Egypt so that the book may be used to special advantage by the many who visit that country and make the trip up the Nile Valley to the cataracts.

WM. HERBERT HOBBS.

Studi di Geomorfologia. Di Gaetano Rovereto. Vol. 1: 1.—Alcuni problemi di geologia e di morfologia della Corsica; 2.—Il M. Cervino; 3.—La Val San Giacomo; 4.—La Valle della Cetina in Dalmazia; 5.—Le Alpi Apuane; 6.—Il M. Cònero; 7.—l'Isola di Capri. 270 pp. Ills. E. Olivieri & Co., Genova, 1908. 10 x 7.

This is a final contribution to the author's investigations on coastal morphology. The sequence in his researches is apparent. He has proceeded systematically inland from the sea-shore by examining valleys first and the mountainous regions at their head afterwards. Each of the regions described must be considered as an applied example of principles previously advanced by him. The hydrography in each case has been investigated with particular care. The results of human occupation are considered somewhat too briefly for a region like the basin of the Mediterranean where the relation of man to land forms might be worked up admirably.

LEON DOMINIAN.

Sand Dunes and Salt Marshes. By Charles Wendell Townsend. 311 pp. Ills., index. Dana Estes & Co., Boston, 1913. \$2. 8½ x 6.

For twenty years the author has studied the sand dunes and salt marshes of Ipswich, and all the forms of life associated with these physiographic features. The scientific data collected are presented in this book. Some of